CLAIMS

1. Method of assigning one or more spreading sequences to a user of a Multi-Carrier Code Division Multiple Access transmission network, each element of the said sequence being, at a transmitter of the said network, multiplied by a data item to be transmitted and then transmitted on a corresponding sub-carrier, characterised in that it consists of assigning, to the said user, the said spreading sequence or sequences, taking into account a predetermined set of spreading sequences.

2. Assigning method according to Claim 1, characterised in that the said predetermined set of spreading sequences includes the set of sequences which are used by the said network at the instant of the assigning.

3. Assigning method according to Claim 1 ~~or 2~~, characterised in that the said predetermined set of spreading sequences includes the set of sequences which are potentially usable after the instant of the assigning.

4. Assigning method according to Claim 1, ~~2 or 3~~, characterised in that the said predetermined set of spreading sequences includes the set of sequences whose transmission it is wished to favour.

5. Assigning method according to ~~one of the preceding~~ claims, characterised in that it consists of allocating, from among all the spreading sequences available at the instant of the assigning, the spreading sequence $c^{(i)}$ which minimizes a function $J^{(j,\Omega_k)}$ representing the interference between the spreading sequence $c^{(i)}$ and the spreading sequences of the said predetermined or given set, the sequence of rank i thus being assigned if this rank i verifies the following relationship:

$$i = \arg_j \min_{j\in\Omega_j, j\notin\Omega_k} \left| J^{(j,\Omega_k)} \right|$$

where Ω_k is the set of the indices of the sequences of the said predetermined or given set and Ω_j is the set of the indices of the available sequences.

6. Assigning method according to ~~one of~~ Claims 1 ~~to 4~~, characterised in that it consists of assigning, to each user, at least one spreading sequence so as to take into account the transmission quality envisaged for this sequence or these sequences.

7. Assigning method according to Claim 6, characterised in that it consists of assigning, to a user desiring a good relative transmission quality, the spreading sequence $c^{(i)}$ which minimizes the cost function $J^{(j,\Omega_k)}$ with the spreading sequences $c^{(k)}$ of a predetermined or given set of sequences of index k belonging to a set Ω_k, to a

user desiring an average transmission quality, the spreading sequence $c^{(i)}$ which gives an average value to the cost function $J^{(j,\Omega_k)}$ with the spreading sequences $c^{(k)}$ of a predetermined or given set of sequences of index k belonging to a set Ω_k and to a user whose transmission quality can be a minimum, a spreading sequence $c^{(i)}$ without worrying about the distortion on this sequence.

8. Assigning method according to Claim 5 ~~or 7~~, characterised in that the cost function $J^{(j,\Omega_k)}$ representing the interference between the spreading sequence $c^{(j)}$ and sequences $c^{(k)}$ of indices k belonging to a set Ω_k is defined as being equal to the maximum value taken by a function $D^{(j,k)}$ representing the degradation of the transmission which is induced as a result of the interference between the spreading sequence $c^{(j)}$ and the spreading sequence $c^{(k)}$:

$$J^{(j,\Omega_k)} = \max_{k\in\Omega_k} D^{(j,k)}$$

9. Assigning method according to Claim 5 ~~or 7~~, characterised in that the cost function $J^{(j,\Omega_k)}$ representing the interference between the spreading sequence $c^{(j)}$ and K sequences $c^{(k)}$ of indices k belonging to a set Ω_k is defined as being equal to the average of the values taken by a function $D^{(j,k)}$ representing the degradation of the transmission which is induced as a result of the interference between the spreading sequence $c^{(j)}$ and the sequence $c^{(k)}$:

$$J^{(j,\Omega_k)} = \frac{1}{K}\sum_{k\in\Omega_k} D^{(j,k)}$$

10. Assigning method according to Claim 8 ~~or 9~~, characterised in that the said degradation function $D^{(j,k)}$ is defined as follows:

$$D^{(j,k)} = E\left[\left(\sum_{m=1}^{M} h_m'^{(j)} c_m^{(j)} c_m^{(k)}\right)^2\right] \text{ or } D^{(j,k)} = E\left[\left(\sum_{m=1}^{M} h_m'^{(k)} c_m^{(j)} c_m^{(k)}\right)^2\right]$$

where E is the mathematical expectation, M the number of sub-carriers used in the MC-CDMA transmission system and $h_m'^{(j)}$ is the apparent response of the transmission channel in view of an equalization process implemented in the receiver,

the response for the frequency of the sub-carrier of rank m and for the receiver of the user of the sequence of rank j.

11. Assigning method according to Claim 8 ~~or 9~~, characterised in that the said degradation function $D^{(j,k)}$ represents the small size of the high-frequency components of a sequence $\chi^{(j,k)}$ of N elements resulting from the element-by-element product of the sequence $c^{(j)}$ and the sequence $c^{(k)}$.

12. Assigning method according to Claim 11, characterised in that the value of the said degradation function $D^{(j,k)}$ is given by the application of a Fourier transform to the said sequence $\chi^{(j,k)}$ of N elements resulting from the element-by-element product of the sequence $c^{(j)}$ and the sequence $c^{(k)}$.

13. Assigning method according to Claim 11, characterised in that the value of the said degradation function $D^{(j,k)}$ is given by the number of {+1,-1} and {-1,+1} transitions appearing in the said sequence $\chi^{(j,k)}$ of N elements resulting from the element-by-element product of the sequence $c^{(j)}$ and the sequence $c^{(k)}$.

14. Assigning method according to ~~one of the preceding~~ claims, characterised in that it is implemented dynamically and therefore consists of re-assigning during transmission, at predetermined instants, the K-Q sequences still necessary for the different transmissions, K being the number of spreading sequences used previously before Q sequences from among K (Q<K) were made available.

15. Assigning method according to Claim 14, characterised in that it consists of:

- Calculating the cost functions $J^{(j,\Omega_k)}$ for any spreading sequence $c^{(j)}$ where j belongs to the set Ω_Q of the indices of the sequences made available,
- Calculating the cost functions $J^{(k,\Omega_k)}$ for any spreading sequence $c^{(k)}$ where k belongs to Ω_{K-Q} of the indices of the sequences still used,
- As long as there exists one or more spreading sequences of index $j_0 \in \Omega_Q$ and one or more spreading sequences of index $k_0 \in \Omega_{K-Q}$ such that $J^{(j_0,\Omega_k)} < J^{(k_0,\Omega_k)}$, de-allocating the sequence $c^{(k_M)}$ defined by:

$$k_M = \arg_k \max_{k\in\Omega_{K-Q}} \left| J^{(k,\Omega_k)} \right|,$$

and allocating instead the sequence $c^{(k_m)}$ defined by:

$$k_m = \arg_k \min_{k\in\Omega_Q} \left| J^{(k,\Omega_k)} \right|$$

16. Assigning method according to Claim 14, characterised in that it consists of

- Calculating the cost functions $J^{(j,i_0)}$ for any spreading sequence $c^{(j)}$ where j belongs to the set Ω_Q of the indices of the sequences made available,
- Calculating the cost functions $J^{(k,i_0)}$ for any spreading sequence $c^{(k)}$ where k belongs to Ω_{K-Q} of the indices of the sequences still used,
- As long as these exists one or more spreading sequences of index $j_0 \in \Omega_Q$ and one or more spreading sequences of index $k_0 \in \Omega_{K-Q}$ such that $J^{(j_0,i_0)} < J^{(k_0,i_0)}$, deallocating the sequence $c^{(k_M)}$ defined by:

$$k_M = \arg\max_{k \in \Omega_{K-Q}} \left[J^{(k,i_0)} \right],$$

and allocating instead the sequence $c^{(k_m)}$ defined by:

$$k_m = \arg\min_{k \in \Omega_Q} \left[J^{(k,i_0)} \right]$$

17. Transmitter of a Multi-Carrier Code Division Multiple Access transmission system, the said transmitter having means for multiplying a user data item by each of the elements of at least one spreading sequence and means for modulating on a subcarrier each of the signals originating from the said multiplication means, characterised in that it has means of assigning, to a user, at least one spreading sequence, the said assigning means being provided for implementing one of the methods according to ~~one of Claims~~ claim ~~1 to 16~~.